COMPUTER EDUCATION IN NCATE COLLEGES

BY

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to Mardrivon, Patrick, Kimberly, and Evelyn

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COMPUTER EDUCATION IN NCATE COLLEGES

By

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Major Department: Instructional Leadership and Support

The purposes of this study were to determine the status of computer training in selected institutions accredited by the National Council for the Accreditation of Teacher Education (NCATE), to assess computer usage in these teacher education programs on the basis of usage of innovations, and to compare the present use of computers in these teacher education programs with an earlier investigation of computer courses offered to preservice and in-service teachers.

Six strata of institutions were identified within the population (n=529). Three strata were public institutions that offered bachelor's only, bachelor's and master's, or bachelor's through doctorate degrees and three strata were private institutions with similar degree offering status.

From the sample size of 182, 144 institutions responded. Thirty-seven (14 private and 23 public) or 26% had computer awareness programs for preservice teachers and 68 institutions planned to implement programs in the near future. A comparable study by Baker in 1976 found that 93 institutions out of 250 (37%) had computer awareness programs for preservice teachers.

The Levels of Use (LoU) of an innovation, the theoretical basis of this investigation, were developed by Hall and others in 1973, 1975, & 1977. The LoU range from a lack of knowlwedge about the existence of an innovation to a complex highly effective use and an active search for a superseding innovation. This study used five of the eight LoU--nonuse, preparation, routine, refinement, and integration. Thirty-seven (26%) of the institutions were at nonuse, 44 (30%) were at preparation, seven (5%) were at routine, 29 (20%) were at refinement, one (1%) was at integration, and 26 (18%) were not classifiable.

On the basis of this study, it is recommended that institutions having successful computer awareness programs for preservice teachers be identified and their methods of program initiation and implementation be described. Studies should be conducted to find financial resources that will assist teacher training institutions in implementing programs. This study should be replicated in three or four years, using all institutions accredited by NCATE and using all eight LoU, to determine further progress in introducing computer awareness programs into teacher education.

CHAPTER I
INTRODUCTION

The purposes of this study were 1. to ascertain the status of instructional computing training in teacher education programs accredited by the National Council for the Accreditation of Teacher Education (NCATE), 2. to assess the progress being made in the use of computers in teacher education on the basis of a theoretical set of constructs regarding levels of usage of innovations, 3. to compare the present use of computers in teacher education programs with the results of Baker's (1976) investigation of the type of computer courses offered to prospective and practicing teachers within American colleges and universities.

Need for the Study

Recent assessments of a large number of educational innovations indicate that these innovations have been generally unsuccessful in achieving their goals (Berman & McLaughlin, 1976; Boyd, 1979). In many cases this lack of success has been attributed to the fact that the innovations have not been implemented, or, at best, only partially implemented (Charters & Jones, 1973; Hall & Loucks, 1977). Such findings have sparked a heightened interest in the implementation process in general and, more specifically, in a quest for those factors or causes associated with successful implementation (Berman & McLaughlin, 1976). For the most part, published studies on the implementation of innovations in the field of education are few and the range of variables considered has been limited and has tended to focus on the level of actual use of an innovation. This led to the central idea of this study, the implementation of a technological innovation in education.

Many technological innovations have been tried and never fully adopted. It has often been said that in education, a span of nearly 50 years would have to elapse after an educational innovation has been shown to be effective before it would be adopted by half of the educational institutions in this nation (Tyler, 1980).

Hechinger (1976) looked specifically at the failure of two technological innovations, closed-circuit television and teaching machines. Closed-circuit television began in the 1950s with a grant from the Ford Foundation's Fund for the Advancement of Education. In that review, Hechinger cited two reasons for the decline of closed-circuit television's popularity: 1. Many teachers were fearful of the "tube" because it could magnify both good and bad teaching and could expose their shortcomings to a larger audience than to those who were confined within the classroom. 2. Inflexibility of programming forced the teacher to use a particular lesson when it was difficult to fit into the natural progress of learning.

Further, Hechinger saw that the major problem with teaching machines, invented during World War II, was that suitable teaching materials (software) to be used in the machines (hardware) were extremely difficult to design. The design problem was exacerbated "by the fast competing hardware producers who tried to make their machines exclusively applicable to their own software" (p. 81). Hechinger indicated that the supporters of teaching machines claimed that individualization of instruction would occur by allowing students to work singly or at their own pace, while opponents claimed that teaching machines were actually designed to promote conditioned learning or regimentation rather than individual learning.

Richards (1974) found four reasons why instructional technology was not as successful as its proponents would desire.

> 1. The educational establishment is not going to put money into instructional technology as long as it does not recognize any urgent need for it.
>
> 2. Institutional economics usually are dedicated to maintaining the status quo.
>
> 3. The role of directors of instructional technology is ambiguous. On the one hand, many of them are trained to lead faculty in the best use of educational communications while on the other hand, most directors seem to act as service people, either defacto or by their own choice.
>
> 4. Institutional leaders are not leading. They do not focus the faculty's attention on the attitudinal learning, and motivational potentials inherent in the use of instructional technology; they do not identify existing teaching and learning deficiencies instructional

> technology might help remedy, or support innovation and experimentation, or set up channels for the diffusion of innovation; and they do not help instructional technology personnel fulfill their own creative and leadership roles. (pp. 482-483)

Gropper (1980) believed that instructional technology had failed because of the public's attitude toward innovation. The public saw every idea as a quick remedy to whatever education ill it was supposedly designed to cure. "Johnny's inability to read and write is serious enough a problem to make each new educational fad appear to it as the answer" (p. 37).

Typer (1980) reviewed several technological innovations, among them, the use of typewriters for children in the primary grades about 60 years ago, the use of silent motion pictures 50 years ago which was quickly followed with sound movies, and the use of radio during the 1930s. There were high expectations for the success of these innovations when they were first introduced, but Tyler indicated that they never caught on and their use declined after a brief period of trial.

Gropper (1980) concluded that we would all do well to heed Santayana's advice about the consequences of not learning from history. "If instructional technology, 10, 20, or 30 years from now is not to be judged the fad that held sway during the 1970s, what must be done" (p. 39)? He called for a systematic process from task description to formative evaluation and for the establishment of a concrete link between practice and theory.

To researchers examining the problems and shortsomings of other types of technological innovations, computers appear to have great promise. Sanders (1981) indicated that "computers can bring to the educational process such attributes as untiring patience, around the clock availability, and individualized and student-paced instruction programs, thus insuring the future of computers in the educational process" (pp. 480-481).

Slotnick and Slotnick (1979) believed that using a computer may have to become a basic skill that is being taught along with reading and writing. They felt that in the not too distant future it would be possible to imagine a real computer (a computer system with cassette tape, display, printer, keyboard, and a reasonable quantity of primary storage) cheap enough to be bought by (or given to) every high school student.

Teachers need to have a background to cope with the increasing literacy of young people in computer usage, according to Ellis (1978), because children are born into a society that has computer games and information retrieval systems in libraries; they receive calculators in their Christmas stockings and, most likely, when they go to start their first bank account it will be on a computerized system.

Evans (1979) a proponent of computer literacy wrote, "computers, in other words, have not arrived on the scene for aesthetic reasons, but because they are essential to the survival of a complex society, in a way that food, clothing, housing, education, and health service are essential to a slightly simpler one. The truth is that one of the main problems of the time is that our world suffers from information overload, and we can no longer handle it unaided" (p. 67).

According to Newlove and Hall (1976) in order to insure the success of an innovation, there is one necessary prerequisite that needs to be considered. They believe that when the implementation of an innovation is planned, managers of change need to anticipate self-concerns and initiate actions to accomodate and resolve them at the outset of the innovation effort. Therefore, Ellis (1978) believed that educators must heed the convinving signs and make significant changes in the teacher education programs because what once was considered an extravagant use of taxpayers monies, buying computers, has now become a vital necessity--a computer in all classrooms. Instructional computing must be included in teacher training programs so that future teachers can provide the most effective teaching possible and be able to prepare students for the world they will enter.

One way to assess the progress of teacher preparation in the use of computers is by examining a body of research that was designed to assess the degree of implementation of any innovation. This research (Hall, Loucks, Rutherford, and Newlove, 1975; Hall, Wallace, and Dossett, 1973; Loucks, 1977) identified eight discrete stages that an individual or an organization may demonstrate as evidence in implementing an innovation and called the stages Levels of Use of the Innovation. According to Hall, Loucks, Rutherford, and Newlove (1975), "These levels range from a lack of knowing that the innovation exists to an active searching for a superseding innovation. The Levels of Use (LoU) dimension describes the various behaviors of the innovation user through various stages--from spending most efforts in _orienting_, to _managing_, and finally to _integrating_ use of the innovation" (p. 52).

The LoU and their names are presented here.

Level of Use	Name
0	Nonuse
I	Orientation
II	Preparation
III	Mechanical Use
IVA	Routine
IVB	Refinement
V	Integration
VI	Renewal

From the LoU list, levels 0, II, IVA, IVB, and V formed the central basis of the theoretical set of constructs and its relation to the levels of usage of innovations that was investigated in this study.

Baker (1976) conducted a study similar to this one that culminated in the development of Fastback 82--_Computers in the Curriculum_--for the Phi Delta Kappa Educational Foundation. The major difference in this investigation and Baker's investigation was that Baker gathered data about computer training for both preservice and in-service teachers, while the major focus of this study was to collect data about computer training programs for preservice teachers only.

Baker selected 250 institutions of higher eduaction ranging from large, well-known universities offering the doctorate to small colleges offering only the baccalaureate degree. The investigation revealed that the majority of American colleges of education did not offer instructional computing courses designed specifically for either preservice or in-service teachers. Only 37% offered computer courses designed specifically for both groups. However, 15% of the institutions provide at least one suitable general computer course outside the college of education and if that percentage is added to the 37%, then the total of 52% suggests that about one-half of the institutions of higher education in America were providing some type of opportunity for computer education.

Baker indicated that in most colleges of education, students had a choice about taking computer courses, and that many did not elect computer courses; therefore, only a small percentage of preservice teachers actually became computer literate.

Definitions

The first eight definitions refer to the Levels of Use model (Hall et al., 1975, p. 54).

Nonuse. State in which user has little or no knowledge of the innovation, no involvement with the innovation, and is doing nothing toward becoming involved.

Orientation. State in which the user has acquired or is acquiring information about the innovation and/or has explored or is exploring its value orientation and its demands upon the user system.

Preparation. State in which the user is preparing for first use of innovation.

Mechanical Use. State in which the user focuses most effort on the short-term, day-to-day use of the innovation with little time for reflection. Changes in use are made more to meet user needs than client needs. The user is primarily engaged in a stepwide attempt to master the task required to use the innovation, often resulting in disjointed and superficial use.

Routine. Use of the innovation is stabilized. Few if any changes are being made in ongoing use. Little preparation or thought is being given to improving innovation use or its consequences.

Refinement. State in which the user varies the use of the innovation to increase the impact on clients within immediate sphere of influence. Variations are on knowledge of both short- and long-term consequences for clients.

Integration. State in which the user is combining own efforts to use the innovation with related activities of colleagues to achieve a collective impact on clients within their common sphere of influence.

Renewal. State in which the user re-evaluates the quality of use of the innovation, seeks major modifications of or alternatives to present innovation to achieve increased impact on clients, examine new developments in the field, and explores new goals for self and the system.

The following definitions are germane to computer usage and programming.

Time sharing. The use of specific hardware by a number of other devices, programs, or people simultaneously in such a way as to provide response to each of the users.

Microcomputers. The smallest category of computer, consisting of a microprocessor and associate storage and input/output elements.

FORTRAN (FORmula TRANslator). A high-level language used to perform mathematical computations.

BASIC (Beginners All-purpose Symbolic Instruction Code). A terminal programming language frequently used in timesharing.

APL (A Programming Language). A mathematically-oriented language frequently used in timesharing.

PL/I (Programming Language I). A high-level language designed to process both scientific and file-manipulating applications.

PASCAL. First major language created and can be used for both scientific and file-processing applications.

Procedures

A computer search, through ERIC, was done to determine if studies identical to this one had been conducted. After none was located, the development of this study began with the designing of an Instructional Computing Questionnaire that would elicit responses that were pertinent to this study.

The questionnaire, the chief data-gathering instrument (see Appendix A), contained 20 items with some items containing subparts. The questionnaire was pretested (Borg & Gall, 1979) with a group of individual who had expertise in designing and implementing instructional computing programs for preservice teachers. When the comments were received from the pretest group, the questionnaire was carefully examined. Some comments were invaluable aids in improving the wording of many questionnaire items and some were helpful in improving the appeal of the questionnaire format to the subjects, hence, increasing the probability of a high rate of return of questionnaires from respondents. Questionnaire items, in some cases, were redesigned and rearranged in order to provide for a logical sequence of thought and to integrate them into a theoretical framework that would allow for a more meaningful study and an easier method of data analysis.

The institutions selected for this study were those appearing on the 1979-80 list of colleges and universities having NCATE accreditation. The total NCATE population (n=529) was subjected to a stratified random sampling technique according to Ary, Jacobs, and Razavieh (1972).

Six strata were defined

I. Privately supported (including parochial institutions) colleges and universities offering bachelor's degrees in teacher education

II. Privately supported colleges and universities offering bachelor's and master's degrees in teacher education

III. Privately supported colleges and universities offering bachelor's, master's, and doctorate degrees in teacher education

IV. Publicly supported colleges and universities offering bachelor's degrees in teacher education

V. Publicly supported colleges and universities offering bachelor's and master's degrees in teacher education

VI. Publicly supported colleges and universities offering bachelor's, master's, and doctorate degrees in teacher education.

Each of the 529 institutions was assigned to one of the six strata previously described and 35 institutions were randomly selected from each stratum, with the exception of stratum III which contained only seven institutions which were included in the sample. The total sample size was 182 institutions.

The Yearbook of Higher Education (1980) was consulted to get the names of deans of colleges of education in the sample or the name of the department chairperson in institutions where there was no college or school of education. The intent was to have the name of a person at each institution who could be corresponded with directly, hence, increasing the probability of a high rate of returns. All letters were sent out over the signature of David C. Smith, Dean, College of Education, University of Florida.

The Instructional Computing Questionnaire was mailed to each of the 182 NCATE institutions comprising the sample. Each questionnaire was addressed specifically to the dean of the college of education, where appropriate, or the department or division chairperson and consisted of an explanatory cover letter (See Appendix B) plus a stamped self-addressed envelope. To further enhance the probability of a high rate of returns, Dean Smith personally reviewed the list of institutions that comprised the sample and selected those deans and department chairpersons whom he personally knew and wrote each a personal note requesting their participation in the study. A cover letter requested that respondents return the questionnaire within two weeks in the enclosed stamped self-addressed envelope. A space was included on the questionnaire that permitted the respondent to request a copy of the final results of the study.

At the end of a three week period, 67% of the questionnaires had been returned. A follow-up mailing was done one week later.

Another questionnaire, stamped self-addressed envelope and cover letter (See Appendix C) were mailed requesting that questionnaires be returned one week from the date that the questionnaire was mailed out. This second mailing yielded an additional 23 questionnaires, thereby increasing the total percentage of returned questionnaires to 79%.

For purposes of analysis, responses were grouped under each level of use identified earlier (nonuse, preparation, routine, refinement, and integration). This allowed for an assessment of the status of instructional computing at the NCATE approved institutions which participated in the study. Statements were then developed that described the LoU of the Innovation by stratum and the sample as a whole.

Analysis of the Data

In order to achieve the three purposes identified earlier, the following questions were investigated.

1. How many schools of education were including computer training in the curricula of preservice teachers?

2. Were there differences in the level of inclusion of computer training for preservice teachers between privately supported and publicly supported institutions of higher learning?

3. What schools were at these levels of use (LoU) in the implementation of computer training in preservice teachers' curricula: nonuse, preparation, routine, refinement, and integration?

4. Were there differences in the LoU between the privately supported and publicly supported institutions of higher learning?
5. Was there a decrease or an increase in the number of institutions that provided instructional computing training for preservice teachers when compared with Baker's (1976) investigation?

In order to answer the questions, the following procedures were used. When all questionnaires were received, the responses were coded and keypunched onto computer cards for analysis. Data were analyzed using the Statistical Analysis System (SAS).

Question 1 was answered by having the computer evaluate item number 1 of the questionnaire which reads, "Does your institution offer any type of computer awareness (computer literacy) program designed specifically for preservice teacher?" Question 2 was answered by examining the computer printout and comparing the number of institutions in each group (publicly supported and privately supported institutions) that had instructional computing training in the curricula of preservice teachers.

Question 3 was answered by analyzing the answers to the following items from the questionnaire: 1, 3A, 11, and 14. Depending on the respondents' answers, it was possible to determine the number of institutions that were at LoU 0 (nonuse), LoU II (preparation), LoU IVA (routine), LoU IVB (refinement), and LoU V (integration). Question 4 was answered by comparing the number of institutions in each group (publicly supported and privately supported institutions) that were at the LoU mentioned above.

Question 5 was answered by analyzing the responses to item number 1. The responses to this item were compared with the results of Baker's (1976) investigation which determined the percentage of colleges of education that offered one or more courses to preservice teachers.

Limitations of the Study

1. The sample was drawn from the list of NCATE approved colleges and univeristies only.

2. The results were based on the questionnaires that were returned. Those institutions which returned questionnaires may have included a disproportionate share of those with courses in computer instruction. This could bias the results and constitute a threat to external validity.

3. The design of the questionnaire did not permit the gathering of some information that could have been elicited by an interview.

4. The design of the questionnaire did not permit the determination of the percentage of respondents at each LoU; however, it did determine the percentage at the following levels: nonuse, preparation, routine, refinement, and integration.

Delimitations of the Study

1. The study was delimited to what was happening with the training of preservice teachers in colleges/departments of education rather than in-service teacher training.

2. There may have been effective training going on in computer science departments located outside the teacher education

program, and thus not covered by this study (e.g., mathematics students in the education department may have been studying computers in the Computer Science Department).

CHAPTER II
REVIEW OF LITERATURE

This section presents a review of the literature as it relates to the three purposes stated in the previous section. Four areas of concern are discussed: 1. increased use of computers in general, 2. use of computers in schools, 3. inclusion of computer training in teacher education programs, and 4. computing competencies needed by teachers.

Practically every segment of society, including schools uses computers to improve the efficiency of their operations. The apparent increase in the number of computers found in schools is an indication of their growing acceptance by educators. Computers are used for more than administrative purposes, for teachers are using them for computer-assisted instruction (CAI), computer-managed instruction (CMI), and to perform any other duties that increase their efficiency. With the increasing pervasiveness of computers in classrooms, it becomes important for new teachers to gain the competencies necessary to incorporate instructional computing into their teaching.

Increased Use of Computers in General

Slotnick and Slotnick (1979) underscored the pervasiveness of computers by reporting that in 1950 there were no more than 30 computers on the face of the earth and by 1976 there were estimated to be approximately 400,00 in use. They are used in numerous ways that help to keep our society functioning. They are use to control industrial processes, to produce weather forecasts, to schedule classes and keep records, to handle payroll and other accounting procedures, and to reserve airline seats to mention only a few tasks that computers perform to make life a little simpler.

Evans (1979) saw a rapid expansion of computer usage because of the tremendous increase in the amount of knowledge generated yearly. He saw computers as very important and necessary instruments that were crucial to the survival of an increasingly complex society in ways that meeting our basic needs (i.e., food clothing, etc.) were crucial to a slightly simpler society. Michael (1968) pointed out that we must educate about computers so that people can cope efficiently, imaginatively, and perceptively with information overload.

Henderson (1978) indicated that modern America was a computerized technological society which utilized computer devices ranging from micro-processor watches to large, complex timesharing systems where the typical employee was required to work with and understand computer input and output materials, whether in insurance, banking, farming, sales, services, etc., therefore, making it important that every high school student have a general understanding of computers and computer applications.

Michael (1968) wrote that by and large people who are ignorant of computer usage will be considered functionally illiterate in the next two to three decades as are those now who are functionally illiterate because of the lack of reading, writing, and arithmetic skills. It is believed that computers will become so pervasive in the future that using a computer will become a basic skill that is taught along with reading, writing, and arithmetic (Slotnick & Slotnick, 1979; Bass, Brown, & Nold, 1975). This argument assumes that the technology for computer manufacturing will be so advanced that computers can be purchased by anyone who desires who desires to own one.

The literature shows that all phases of our society are confronted with the increased use of computers and the time is rapidly approaching when knowledge of computer usage will be a required skill in order to gain employment in a society that is continuing to be made more and more complex by the increased use of computer technology. Therefore, if schools are to adequately prepare students to survive in an increasingly complex technological society, then more computers will need to placed in schools, and every student afforded an opportunity to learn as much as possible about the use of computers.

Use of Computers in Schools

Morgan and Richardson (1972) concluded that a computer in a classroom "is not a panacea for all instructional problems, but as one component of a comprehensive systems-designed curriculum, however, it can serve as a catalyst for speeding and improving the instructional process" (p. 73). However, over the last eight or nine years there has been a change of attitude about the use of computers as instructional supports. No longer are computers relegated to a corner to gather dust and no longer is there fear that computers will replace teachers. Now more and more schools are actively engaged in making computers an integral part of their curricula.

Baker (1976) polled 125 school superintendents in 50 states. There were 78 responses and from that total, 53% indicated that their districts used computers for instructional purposes and 8% indicated that plans were being made to use computers in classrooms. It should be noted that Baker's report did not specify the grade level (i.e., elementary or secondary) where either computers were used or were to be used. If these statistics are generalized to the total population, then the figures suggest that approximately three-fifths of the nation's school districts were either using or planning to use computers as instructional aids in 1976.

For almost 10 years, the state of Minnesota has been making an effort to use the computer in education as an administrative tool, as an aid in instruction, and for computer literacy programs. In 1981 there were computers in use in each of the state's 435 school districts with the value of the state's computing equipment estimated to be worth more than $44 million. However, Minnesota's program is not unique, for in several other states there are programs, usually in individual school districts only, that reflect concentrated computer literacy efforts. Texas, California, Florida, and North Carolina are mentioned most frequently in the literature.

A study of computer usage in schools was done for the American Institutes for Research by Bukoski and Korotkin (1976) to determine the extent and type of computer use in U. S. public secondary schools. The resulting report, "Survey of Computing Activities in Secondary Schools" showed that over 58% of the nation's secondary schools used computers to aid their administrative or instructional programs. When Bukoski and Korotkin compared this research to an identical study done by them in 1970, it was found that the level of usage of computers in secondary schools had increased by 24% (from 34% to 58%). Bukoski and Korotkin concluded the report with this analysis. "Though the use of computers has not as yet been universally introduced in every school, the adoption of computer technology in secondary education has been both steady and stable with more and more schools accessing computers each year while fewer schools are terminating a previously established computer application" (p. 9).

On the future growth of computer usage in secondary schools, Bukoski and Korotkin (1976) believed that the growth of secondary school computing for the five year period (1970-1975) was a strong indicator that, within the next 10 years, every secondary school in the country would have access to a computer system for some type of administrative and/or instructional application.

Chambers and Bork (1980) summarized a study done by the Task Force on Computer Assisted Learning of the Association for Computing Machinery's Sub-Committee on Computing in Secondary and Elementary Schools. The primary purpose of that study was to assess the current and projected use of computers in U. S. public secondary and elementary schools, with special emphasis on the use of the computer assisted learning. School superintendents in 974 school districts were selected to participate in the study. The percentage of superintendents that responded was 62.3. The analysis of the data revealed the following statistics (only statements that were germane to this study were selected).

1. In 1980, the percentage of school districts that used the computer for instructional and/or administrative purposes stood at 90% It was projected to rise to 94% by 1985.

2. Between 1970 and 1980, the best estimates of instructional usage of the computer showed increases from 13% in 1970 to 74% in 1980. Instructional usage is anticipated to reach 87% of the districts by 1985.

3. Computer assisted learning was currently in use in 54% of the districts, and represented the type of usage reported by the second largest number of districts.

4. Heaviest usage of computer assisted learning was in the nation's secondary schools. The Mathematics departments showed the largest usage, followed by the Natural Sciences, Business, and Language Arts.

5. Most computer assisted learning programs in use in the districts were written in BASIC were acquired from outside the district, were predominantly drill and practice, and ran on a variety of large, mini, and microcomputers.

6. Secondary/elementary faculty and students gave computer assisted learning a high rating.

> 7. Projections for 1980 indicated that computer assisted learning would be used by more school districts than any other type of computer application. Usage was anticipated to rise from 54% of the districts to 74%. (p. 50)

Inclusion of Computer Training in Teacher Education Programs

This section includes two broad areas: 1. change in teacher education in general and 2. change in teacher education in order to provide training in instructional computing for preservice teachers. Consideration of the innovation of adding computer education to teacher education programs needs to be viewed in relation to general changes in teacher education. The idea of change has been slow in coming especially where teacher education is concerned. The first two reviews indicate that there have been advocates of change in teacher education programs over a period of several years.

Robbins (1969) conducted a study that addressed changes in teacher education on a general basis with 200 Minnesota school superintendents, 23 members of the faculty at Moorhead State College, and 200 deans of schools of education in selected colleges and universities accredited by NCATE in forty-eight states. The results are related to attempts that are being made to incorporate computer training in teacher education programs. The following conclusions regarding teacher education were reported:

> 1. Traditional teacher education is not adequate to prepare teachers for the schools of the present and the future.

> 2. Minor modifications in teacher education will not be sufficient to prepare teachers for the schools of the present and the future: major modifications are essential.
>
> 3. Teacher education should demonstrate in practice the innovative teaching-learning procedures now found in elementary and secondary schools.
>
> 4. Students in teacher education should have an opportunity to observe and have direct experience with innovative procedures found in the schools today.
>
> 5. Preparation of teachers to function effectively in new programs, and with new practices, is a function of both preservice and in-service teacher education. (p. 187)

Cooper and Sadker (1972) suggested a need for a greater responsiveness to change, not just for the sake of change but because creative change, when congruent with instutional goals, could provide a more effective means of preparing future teachers. They stated, "A sensitivity of societal needs and to developments within the field was a necessity for teacher education" (p. 316). There have long been concerns about whether or not teacher training institutions were sensitive to the needs of society to provide the necessary training for preservice teachers so that new skills and competencies necessary for survival in an increasingly complex technological society could be passed on to others. It has been felt by many that colleges of education, in many cases, moved far more slowly than industry in keeping up with new developments in society and providing skills that allow their graduates to be more competitive in the job market.

Trotter (1975) believed that in the near future, teachers would have to have skills that would be relevant to living in our complex society as well as functioning in the classroom. Because of the broad range of students from diverse backgrounds who will seek education, teachers will have to employ a greater variety of teaching techniques in order to accomodate all students.

Given the relatively slow pace of change in teacher education programs, there is reason to be concerned with the rapidity with which education on the use of computers will be incorporated. If students are to function effectively in a technology-oriented society, then preservice teachers should be trained in computer usage in order to familiarize students with computers (Brooks, 1971). Prospective teachers must be trained to use the computer as an instructional and research tool and this training should encompass not only an understanding of the use of computers in education, but also a rudimentary knowledge of computer programming. Students, at the very least, should become familiar with the lexicon of the computer, so that they can communicate with technicians when they need assistance.

Baker (1976) reported that there was little or nothing about instructional applications of computers in the training of teachers and felt that there was an urgent need for all teachers in training to get experience with the applications of computers.

Milner (1979) found numerous unresolved issues that inhibited the education of teachers at both the preservice and in-service levels. Among those issues were the following:

> 1. lack of certification and experience requirements for teaching computer-related courses;
> 2. lack of educators' knowledge of computer application in education;
> 3. lack of training programs and courses;
> 4. low priority given to instructional computing;
> 5. lack of incentives for teachers;
> 6. the need for greater administrative commitment and recognition. (p. 27)

Lewis (1981) believed that the greatest challenge of microelectronics in education would have to be faced by teachers who were already trying to implement a myriad of other innovations in education that were not technological in nature. Training and retraining programs for teachers were not like those appropriate for industry, for the changes envisaged delved deeply into the teacher's role. Lewis argued that although a technological revolution was taking place in society, in education only evolution was possible because of the sparcity of technological training in teacher education programs.

Molnar (1978) believed that the next great crisis in American education is computer literacy and Schnabel (1979) believed that in order to avoid that crisis greater numbers of teachers should be involved in learning about the computer, how to use, and how to develop instructional programs for it. One way to increase the participation of teachers in using computer technology for instructional purposes as to include the computer as part of the teaching team preparing future teachers.

The case for preservice teacher training in the use of computers was strengthened by Dennis (1979a), as he discussed preservice versus in-service training for teachers. He believed that during preservice training, an individual could enter into relatively intensive and lengthy learning experiences because learning skills were at their sharpest and, due to minimal other distractions in the learner's life, attention usually could be focused more intently.

Dennis pointed out that the in-service career differed considerably from that of preservice teachers. Practicing teachers seldom enjoy long periods of time in which to intensively pursue new topics--personal learning skills were not as sharp and attentions were fragmented. During the course of a school day, secondary teachers have to attempt to deal productively and personally with 125-150 different individuals, causing them to "shift gears" cognitively several times in only a few moments between class periods.

Bass, Brown, and Nold (1975) argued for computer literacy among teachers in the belief that when teachers become computer literate they have the added benefit of using the computer as a teaching resource. Just as books, projectors, and a variety of other classroom devices are used today to augment the teacher, computers can also enhance the dynamics of teacher-student interaction. Computers have the unique ability to respond to the learner, enabling a lively linkage between the ideas in the teacher's mind and the receptive minds of the students.

Because computers fulfill this double role as a means of teaching and as objects to be experienced in their role, Bass et al. believed that computers must certainly be presented in similar roles in the education of teachers. They saw the position of computers in the curriculum of teacher education as especially critical because of the teahers' focal responsibility as purveyors of ideas, skills, processes, and most importantly, attitudes making it essential that the teacher's own education create a positive attitude toward computers.

Bass et al. felt that all teachers, even those who did not choose to author programs, needed to know the fundamentals of educational computing. "Every teacher should be informed at least well enough to withstand the pressure of administrators, salesmen, and so-called 'CAI experts'" (p. 55).

When new teachers enter the classroom they will be faced with what is becoming an important area of concern: accountability. Burns (1980) looked at eduational technology and its role with accountability. He saw computers and other forms of technology as instruments which could aid students in acquiring minimal standards. The 1980s, according to Burns, will see the current application of technology to education as an attempt to develop a science of education as opposed to it being an art. Gage (1978) clearly stated that "a scientific basis consists of knowledge of regular nonchance relationships in the realm of events with which the practice is concerned" (p. 20).

Further, Burns saw that more emphasis was being placed on students to be accountable (Bloom, 1980; Lawson, 1979; Mischel & Baker, 1975; Rothkopf, 1970; Wittrock, 1979), for student accountability has been a primary feature of all educational technology plans and systems for at least twenty years, and for the first time, the technology to make student accountability viable seems to be available. Therefore, it now appears that if new teachers are computer literate when they enter the classroom, they will have an important resource to use in the accountability movement.

Perhaps ten years ago the use of computers in classrooms, particularly in elementary and secondary schools, was looked upon as a frill and an innovation that only very liberal or very wealthy school districts engaged in, but Allen and McCullough (1980) did not see them as frills anymore but as a needed part of every classroom. They believed that the teachers who mastered technology would most likely be more successful and effective than teachers who did not.

Because of the increasing demands on teachers' time such as individualized instruction and mainstreaming noted by Allen and McCullough, they need to "be able to summon a much broader range of educational alternatives than was previously required" (p. 47). The computer then could serve as an important alternative to help teachers meet the continuously increasing demands on their time.

Henderson (1978) continued to amplify the need for preservice teacher training by stating that "the necessity that every graduating secondary student be literate about computers indicate a need for every teacher and administrator to have a general orientation to computers and computer systems" (p. 41). Henderson concluded that it would be useful for both teachers and administrators to understand the impact that computers are having on education and the society as a whole. Therefore, in order to become certified, all teachers and administrators should complete a minimum of two courses covering a general orientation to computers and computer systems, and the impact of computers on the modern day society and school system.

If in the near future all high school students upon graduation are to be computer literate, then it will be necessary for all teachers to be computer literate in order to transfer this skill to students. Only by having the computer as an integral part of teacher training curricula for preservice teachers can this goal be realized.

Computing Competencies Needed by Teachers

If computer usage is to become an integral part of this society and if teachers are to be the major vehicles for delivering this aspect of technology to the society, then what kind of competencies should they possess? Dennis (1979b) presented a comprehensive list of competencies necessary for instructional use of computers by classroom teachers. Those competencies are presented here.

1. Familiarity with computerized teaching materials (i.e., instructional programs) in a variety of fields.
2. Ability to integrate computerized teaching materials into a course.
3. General knowledge of the functioning of CMI (Computer-Managed Instruction) systems.
4. Understanding of effective design of drill and practice materials.
5. Ability to apply computerized drill and practice in a variety of teaching situations.
6. Familiarity with computer simulations and models.
7. Experience in preliminary design and construction of a simulation.
8. Knowledge of the uses of simulations as teaching tools.
9. Ability to evaluate the effectiveness of a course that uses computerized teaching materials.
10. Ability to determine the computer needs of a school.
11. Ability to draft specifications (request for proposals) which set down the needs and desires of the school and invite proposals or bids from potential suppliers.
12. Ability to be highly critical of suppliers' proposals and their machines.
13. Ability to assemble data about proposed equipment to facilitate decision-making (costs, performance data, hardware characteristics, software support, etc.).

14. Familiarity with instructional games.
15. Knowledge of how to use instructional games appropriately and effectively in teaching.
16. Physical familiarity with computer equipment (i.e., everyday operation and use of a range of different machines).
17. Knowledge of troubleshooting procedures and means of access to professional help (i.e., knowing how to determine if a piece of equipment is ailing, if it is, knowing whom to call to fix it).
18. Knowledge of sources for computer materials.
19. Knowledge of how to improve less than adequate instructional computer programs.
20. Ability to instruct others in the social role and impact of computers in society.
21. Ability to evaluate the effectiveness of instructional computer programs.
22. Knowledge of alternatives uses of computers in school (i.e., as class recordkeepers, term paper editors, etc.).
23. Awareness of the value of involving students in the development of computerized instructional materials.
24. Knowledge of processes of involving students in instructional materials developing.
25. Knowledge of computer programming. (p. 6)

As Dennis' list of competencies is examined, it would probably be found that some of the competencies are already found in curricula of some colleges of education and are required of some (if not all) of their students. As the pervasiveness of computers grows in the society, it is not inconceivable that some colleges of education will adopt all of Dennis' list of competencies and possibly broaden it to include additional skills that all preservice teachers will need to master.

Concluding Statements

The four areas included in this review of literature, 1. increased use of computers in general, 2. use of computers in schools, 3. inclusion of computer training in teacher education programs, and 4. computing competencies needed by teachers, have all pointed to the computer as a vital and important asset in an increasingly complex society.

The review of literature indicated that the use of computers in all facets of the society has become so pervasive that the general citizenry is rapidly being left behind because of its lack of knowledge about computers. The writers reviewed in this review of literature believed that the only solution to this growing pervasiveness was for training in computer usage to be provided for as many persons as possible. It was felt that this training was so important that it should be considered as the fourth basic skill.

The surveys showed that the use of computers in schools is growing and will continue to grow as computers become more affordable and there is a grasp of the importance of each student being exposed to computers during his/her schooling.

Baker's (1976) study showed that about one-half of the institutions of higher education in America were providing opportunities for computer education. However, the growth of computers in society as a whole and specifically in schools shows that there is an increasing need for more teacher training institutions to provide opportunities for preservice teachers to become proficient in all the competencies that particular schools of education deem necessary for their graduates to be called computer literate. If teachers of today and tomorrow are expected to utilize the computer with confidence and purpose, without fear of either the instrument or of losing their position, computers must be intimately tied to their own lives and their own education (Ellison, 1970).

If computer usage is increasing in society in general, and if computer usage in schools is constantly increasing, then it is necessary to see if opportunities are being provided for preservice teachers to become computer literate. It is also important to see if the number of institutions of higher education offering training in computer usage to preservice teachers has increased since Baker's (1976) study, therefore, giving an indication of whether or not any person who wants the opportunity to learn about computers will soon be provided with it if all preservice teachers have the necessary competencies to develop a computer literate society.

CHAPTER III
METHODOLOGY

This chapter presents a description of the methods used to make a general assessment of the status of instructional computing among NCATE accredited institutions. The methods used in collecting the data and the procedures followed in analyzing the data are described in this chapter.

Procedures Used to Collect Data

This study used a questionnaire of 20 items with some items containing subparts (See Appendix A) as a method of collecting data. A computer search produced some valuable materials that were used as a starting point for the development of the instructional computing questionnaire. Some of the items were designed to measure one of the five levels of usage--nonuse, preparation, routine, refinement, and integration. Other items were developed to gather information on the impact of the computer on teacher education, to make an assessment of the status of computer awareness programs, and to enable the researcher to compare the results of this study with the Baker investigation (1976).

Before the questionnaire was completed, it was submitted to a panel of seven experts for criticism. When all of the comments were received, the questionnaire was revised incorporating the suggestions of each of the seven experts. The questionnaire produced had items arranged in a logical sequence with the expectation that patterns of thought could flow in an uninterrupted manner while it was being answered. The questionnaire items were written requiring three types of answers--a "Yes" or "No" response, a rank ordering; "High," "Medium," or "Low," and an open-ended response. The utilization of the variety of response modes made it possible to collect the needed information in a minimum amount of space.

The sample of 182 institutions used in the study was selected from the 529 NCATE accredited institutions listed in 1979-80. This technique allows objects that are unique to be grouped. The six strata of institutions with NCATE approved teacher education programs and their characteristics are briefly reviewed in this section. Strata I, II, and III are composed of privately supported institutions that offer bachelor's only, bachelor's and master's, or bachelor's, master's, and doctorate degrees in teacher education. Strata IV, V, and VI are composed of publicly supported institutions with similar degree offerings in teacher education. From strata I, II, IV, V, and VI, 35 institutions were randomly selected, while all seven institutions from stratum III were included in the sample (Table 1).

The first mailing of the questionnaire packet was sent directly to the dean or department chairperson previously identified from the 1980 Yearbook of Higher Education. The cover letter (See Appendix B) contained a date by which all questionnaires were to be returned to the investigator. A second mailing containing an explanatory cover letter

Table 1

Breakdown of NCATE Population and Sample By Stratum

Stratum	Population	Sample	Percentage of Sample
I (private colleges/universities offering bachelor's degrees)	137	35	19.23
II (private colleges/universities offering bachelor's and master's degrees)	42	35	19.23
III (private colleges/universities offering bachelor's, master's and doctorate degrees)	7	7	3.84
IV (public colleges/universities offering bachelor's degrees)	82	35	19.23
V (public colleges/universities offering bachelor's and master's degrees)	189	35	19.23
VI (public colleges/universities offering bachelor's, master's, and doctorate degrees)	72	35	19.23
Totals	529	182	99.99

(See Appendix C) and another copy of the questionnaire was sent to all institutions that had not responded to the first mailing by the end of a three week period. The data concerning the returned questionnaires are shown in Table 2.

Procedures Used to Analyze Data

In order to make a general assessment of the status of instructional computing programs, the data on every questionnaire item including the subparts were analyzed. A code was developed whereby each subpart was treated as a separate item for ease in keypunching this information onto computer cards. The responses were transferred from each questionnaire onto a computer coding sheet for keypunching. The data were analyzed using the Statistical Analysis System (SAS). Computing was done using the facilities of the Northeast Regional Data Center of the State University System of Florida, located on the campus of the University of Florida in Gainesville.

In order to achieve the specific purposes of this investigation, answers to the following five questions were sought.

1. How many schools of education were including computer training in the curricula of preservice teachers?

2. Were there differences in the level of inclusion of computer training for preservice teachers between privately supported and publicly supported institutions of higher learning?

3. What schools were at these levels of use (LoU) in the implementation of computer training in preservice teachers' curricula: nonuse, preparation, routine, refinement, and integration?

Table 2

Percentages of Returns of Questionnaires By Stratum
(1st & 2nd Mailings)

Stratum	No. of Questionnaires Mailed	No. of Questionnaires Returned	Percentage of Questionnaires Returned
I	35	31	82.57
II	35	22	62.86
III	7	5	71.43
IV	35	28	80.00
V	35	29	82.86
VI	35	29	82.86
Totals	182	144	79.12

4. Were there differences in the LoU between the privately supported and publicly supported institutions of higher learning?

5. Was there a decrease or an increase in the number of institutions that provided instructional computing training for preservice teachers when compared with Baker's (1976) investigation?

The first purpose was achieved by analyzing item 1 from the questionnaire which reads, "Does your institution offer any type of computer awareness (computer literacy) program designed specifically for preservice teachers?" A comparison was made among the institutions in each group (publicly supported and privately supported) that had instructional computing training in the curricula of preservice teachers.

The second purpose (assessing the levels of usage progress) was achieved by analyzing four questions. To determine institutions at the nonuse level--a state in which the user has little or no knowledge of or involvement with the innovation, and is doing nothing to become involved--items 1 and 3A were used. Item 3A reads, "If you are planning to implement a computer awareness program for preservice teachers in the future, what is the target date for implementation?" If respondents checked the "No" blank of item 1, and if there were no date given for item 3A, then those institutions were categorized under the nonuse level.

To determine the institutions at the preparation stage of innovation implementation--a state in which the user is preparing for first use of innovation--items 1 and 3A were again used. If respondents checked the "No" blank of item 1, and if a date were given for item 3A, then those institutions were categorized under the preparation level of implementation.

To determine which institutions were at the routine stage of implementation--use of the innovation has stabilized and no changes are being contemplated--items 1 and 11 were used as the criteria for making such a determination. Item 11 reads, "Which of the following changes, if any are planned for your computer awareness program in the future: change in length of program, change in number or type of students served, change in scope of program, and change in equipment?" If respondents checked the "Yes" blank of item 1 and did not select any of the four choices in item 11, then they were placed in the routine stage. These institutions were perceived to have stable programs as there were no plans for structural changes in their programs in the near future.

To determine those institutions at the refinement level of innovation implementation--a state in which the user varies the use of the innovation to increase the impact on the preservice teachers in the college of education--items 1 and 11 were again used as the criteria for making such determinations. If respondents checked the "Yes" blank of item 1 and selected one or more of the four choices in item 11, then they were placed in the refinement category.

The final level of use under consideration in this investigation was integration--a state in which the user is combining own efforts to use the innovation with related activities of other colleagues to increase the impact of the innovation on preservice teachers. To determine institutions at this level, items 1 and 14 were used. Item 14 reads, "Approximately what percent of the education faculty utilize computers in teaching their classes?" If respondents checked the "Yes" blank of item 1 and indicated that 50% or more of the faculty utilized computers in teaching their classes, they were judged to be at the integration level of use.

Responses to items 1, 3A, 11, and 14 were used to determine if differences in the levels of usage of instructional computing for preservice teachers existed between privately supported and publicly supported institutions of higher learning.

The third purpose was achieved by comparing the results of this investigation with the results of the Baker (1976) investigation which examined the computer training that was provided for both preservice and inservice teachers. Baker's investigation revealed that more than one-third (37%) of American colleges of education surveyed offered instructional computing courses designed for either preservice or in-service teachers. There were some institutions that provided at least one suitable general computing course outside the college of education that college of education students could take. When the entire study was taken into account, the data showed that more than one-half (52%) of the institutions of higher education studied offered courses in computer education for both preservice and in-service teachers. Further, Baker found that in most colleges of education, courses dealing with computer usage were electives, and that many students did not elect the computer courses. Therefore, it is possible that only a small percentage of preservice teachers actually became computer literate. Questionnaire item 11 was used to compare the results of this investigation with the results of the Baker investigation.

The data gathered from the questionnaire items that were not used to achieve the three purposes are discussed in an "Other Findings of Interest" section. Questionnaire items that had similar points were grouped and the data presented and discussed in order to show the total impact of the computer on teacher training programs.

CHAPTER IV
ANALYSIS AND INTERPRETATION OF THE DATA

The intent of this study was to determine the state of using computers in the preparation of preservice teachers, to determine the progress being made in implementing computer awareness programs in the curricula of preservice teachers--based on the theoretical constructs developed by Hall and others (1973, 1975, 1977), and to compare this study with a similar study done by Baker in 1976. The findings are presented as answers to five questions designed to achieve the purposes of this investigation. Other findings of interest are also reported.

Inclusion of Computer Training in Teacher Education Programs

Question 1. How many schools of education were including computer training in the curricula of preservice teachers? Responses to the questionnaire item (#1) designed to answer this question showed that 37 institutions had some type of computer awareness program for preservice teachers. The respondents' answers by type of institution are shown in Table 3. The six strata used to categorize institutions are described on page 36.

Question 2. Were there differences in the level of inclusion of computer training for preservice teachers between privately supported and publicly supported institutions of higher learning? Fourteen of the 37 institutions that reported the inclusion of

Table 3

Instructional Computing Programs By Stratum

	Stratum I		Stratum II		Stratum III		Stratum IV		Stratum V		Stratum VI		Totals I-VI	
	F	P	F	P	F	P	F	P	F	P	F	P	F	P
YES	7	23	7	32	0	0	2	7	10	34	11	38	37	26
NO	24	77	15	68	5	100	26	93	18	62	18	62	106	73
NR	0	0	0	0	0	0	0	0	1	4	0	0	1	1

NR = No Response; F = Frequencies; P = Percents
Strata I, II, & III = Privately Supported Institutions
Strata IV, V, & VI = Publicly Supported Institutions

computer training were privately supported. This represented 24% of the respondents from privately supported institutions. Of the 86 publicly supported institutions that responded to the survey, 23 (27%) had computing programs for preservice teachers.

Progress of Computer Usage in Teacher Education Programs

Question 3. What schools were at these levels of use in the implementation of computer training in preservice teachers' curricula: nonuse, preparation, routine, refinement, and integration? The method of identifying institutions at different levels was described in Chapter III (pp. 40-42). The results of the analysis of those data are presented here and a statistical presentation is shown in Table 4.

Thirty-seven institutions (26%) were apparently making no effort to develop computer awareness programs for preservice teachers and were placed in the lowest category of implementation--nonuse. There were 44 institutions (30%) at the preparation level developing plans to use computers in teacher education, while 29 institutions (20%) had reached the level of refinement in their use.

In those institutions where 50% or more of the faculty were using computers as a part of their regular instruction, it was judged that the collective impact on students was great enough to say that integration of use had taken place. Only one institution, a small private institution, was identified at the integration level.

There were 26 institutions that could not be classified at any level. Twenty-four of these 26 institutions that were "not classifiable" indicated that they intended to implement computing programs,

Table 4

Institutions at Various Levels of Usage Stages
(All Strata)

	Stratum I n=31		Stratum II n=22		Stratum III n=5		Stratum IV n=28		Stratum V n=29		Stratum VI n=29		Totals I-VI n=144	
	F	P	F	P*	F	P	F	P	F	P	F	P	F	P
Nonuse	11	36	5	23	2	40	12	43	5	17	2	7	37	26
Preparation	9	29	5	23	0	0	10	36	9	31	11	38	44	30
Routine	2	6	2	9	0	0	0	0	2	7	1	3	7	5
Refinement	3	10	5	23	1	20	2	7	8	28	10	35	29	20
Integration	1	3	0	0	0	0	0	0	0	0	0	0	1	1
Not Classifiable	5	16	5	23	2	40	4	14	5	17	5	17	26	18

F = Frequencies; P = Percents; P* - Because of rounding off, the total exceeds 100%
Strata I, II, & III = Privately Supported Institutions
Strata IV, V, & VI = Publicly Supported Institutions

but were not sure of a date for such implementation. They could not be placed in the nonuse category because they were making plans to use computers. However, since their plans were not specific as to date of use, they were not placed in the preparation category. The two other institutions did not answer all questions necessary for the investigator to identify their level of usage status.

Question 4. Were there differences in the levels of usage between the privately supported and publicly supported institutions of higher learning? Table 4 shows the levels of usage status across all strata and can be used to compare levels of usage differences between institutions of similar degree offering status. Table 5 presents the combined responses for all privately supported institutions and for all publicly supported institutions.

The data showed a greater percentage of private institutions were at the nonuse level than were public institutions. More public institutions were at the preparation level than were private institutions. More private institutions were at the routine and integration levels than were public institutions, while more public institutions were at the refinement level than were private institutions. The data indicated that publicly supported institutions appeared to be farther along in the implementation process than did privately supported institutions.

Comparison of Present Level of Computer Awareness Programs with Baker's Investigation

Question 5. Was there a decrease or an increase in the number of institutions that provided instructional computing training for

Table 5

Comparison of Levels of Use Between Privately and Publicly Supported Institutions

	Privately Supported n=58		Publicly Supported n=86	
	F	P	F	P
Nonuse	18	31	19	22
Preparation	14	24	30	35
Routine	4	7	3	4
Refinement	9	16	20	23
Integration	1	2	0	0
Not Classifiable	12	21	14	16

F = Frequencies P = Percents

preservice teachers when compared with Baker's (1976) investigation. Baker found that 37% of the institutions responding to her survey indicated that their colleges of education offered computing courses suitable for preservice teachers. This investigation found that of the 144 institutions that responded to the questionnaire, 26% had instructional computing for preservice teachers (Table 3).

Other Findings of Interest

Beyond the data necessary to answer the five questions previously discussed, the questionnaire yielded additional pertinent information that is presented and analyzed here. In order to present these findings in a logical and easy to understand manner, related data have been organized under broad topics.

Nature of the programs offered. This section reports on the computing programs offered by the 37 institutions that had programs for preservice teachers. The questionnaire items that yielded these data were 4, 5, 6, 7, 8, 9, 10, and 12.

The data showed that 25 of the 37 institutions that have programs have had those programs for two years or less. This raises some concerns about the data reported in the Baker study. In her study (1976) she reported that about one-half of the institutions of higher education provided some type of computer course(s) that was suitable for preservice teachers. Assuming that some of the same institutions included in this study were in the Baker study also, then there is a question regarding the level of agreement regarding a definition of "courses suitable for preservice teachers." If in 1976 one-half of this country's colleges and universities did indeed have computing courses for preservice teachers, then this investigation should have found more institutions that had programs and more programs that had been in existence for more than two years.

When student requirements were examined, there were relatively few institutions that required their students to participate in computing programs. The data showed that nine of the 37 institutions required students to take instructional computing courses. The 28 institutions that did not require all prospective teachers to participate in computer awareness programs indicated that selected groups of prospective teachers were required to take computer awareness courses. Prospective teachers of mathematics, elementary education, and science were the three groups that were most often required to take computing courses. Prospective teachers of social science, business education, and language arts were less likely to be required to take computing courses.

Almost all of the 37 institutions felt that their programs would be more meaningful to students if a "hands-on" component was a part of the computing program. The data showed that 36 institutions had "hands-on" components as a part of their programs. As a further indication of the belief in a "hands-on" component, 25 of the 37 institutions used microcomputers. Nine of that same group indicated that they would procure additional microcomputers, thereby, providing more opportunities for "hands-on" activities for more students.

In order to examine the structural design of computer awareness programs, questionnaire items 7 and 8 requested some program description. Twenty-seven institutions indicated that their programs existed as either a module within an education course or as a full course or seminar; four institutions provided a combination of a module within an education course and a full course or seminar. Five institutions had variations other than those on the questionnaire. These variations included educational measurement courses using computers, open orientations to faculty members and students who requested a microcomputer demonstration, workshop type class called "Computers for the Classroom Teacher," and a combination of word processing, CAI, and graphics. One institution indicated that courses offered in mathematics, science, psychology, and education had computer awareness modules that were sufficient.

To determine the degree of faculty involvement with computer awareness programs, institutions were asked to indicate whether the college of education faculty, or faculty from another department/division conducted the computer awareness program. The data showed that 23 programs were conducted by college of education faculty while five programs were conducted by computer science faculty. Six institutions said that their programs were conducted jointly by faculties from education and computer science. In two institutions, programs were conducted by the departments of science, mathematics, and instructional technology, and at one institution, the school of medicine.

The composition of the computing programs was determined by asking respondents to select the type of skills (i.e., writing programs, reviewing programs, etc.) and programming languages (i.e., BASIC, FORTRAN, etc.) that were taught to preservice teachers. The data showed that a wide variety of skills and programming languages were being taught to prospective teachers. When the data were examined, the vast majority (31) of the respondents checked off two or more skills. When the questionnaires were examined to identify the specific skills that the 31 institutions reported, "writing programs" and "reviewing programs" were chosen by 26 and 24 institutions respectively, while "use of the computer as a problem solving tool," "designing programs" and "modifying programs" were chosen by 20, 17, and 16 institutions respectively.

Respondents were given the opportunity to write in additional skills not listed on the questionnaire. Topics taught to students that were mentioned included: use of the computer for simulations and tutorials, effective use of the terminal in a classroom, courseware evaluation, changing modes of computer utilization, computer terminology, computer literacy competencies, and resources for teaching computer literacy.

The wide range of skills taught to prospective teachers indicate that some colleges of education have a fairly keen perception of the competencies needed by preservice teachers. If this list is compared with Dennis' (1976b) list of competencies presented in Chapter II, it appears that one or more colleges of education were developing each of the competencies deemed necessary for future teachers to be called computer literate. In addition, the data showed that BASIC was the programming language most frequently taught to preservice teachers, while PILOT, FOCAL, COBOL, and JCL were mentioned as other programming languages that were taught.

Computers and the education faculty. All institutions (those having programs and those not having programs) were asked if a "training program" was available for education faculty to gain expertise in instructional computing skills. The data showed that 64 institutions (25 of the 37 that had computer awareness programs for preservice teachers and 39 of the 106 that did not have programs--Table 3) of the 144 that responded had such programs.

In order to study the degree of faculty involvement with computers, institutions were asked to check off the approximate percentage of their faculty that utilized computers in teaching their classes. One hundred-thirteen of all (144) institutions said that faculty use of computers in classrooms was between zero and 25%. Eight institutions said that faculty usage was between 26% and 50% and one institution said that its faculty usage was between 51% and 75%.

With the large number of institutions having zero to 25% usage of computers in classrooms, it is safe to assume that many institutions are at the zero level of faculty usage of computers in the classroom. When the data on the 37 institutions that had programs were re-examined, 32 of those institutions' faculty usage of computers in the classroom were between zero and 25%.

Since one major weakness has been identified--few institutions require all preservice teachers to participate in the computer awareness program--another exists in that there are only a small number of faculty that are using computers in teaching their classes. The development of strong computer awareness programs for preservice teachers will require that all education majors become computer literate and that larger numbers of education faculty begin to use computers as teaching tools in their classrooms.

Planned changes in programs. In this day of rapidly increasing technology, institutions need to constantly evaluate and upgrade their preservice instructional programs in order to keep abreast of the most recent advances in computer hardware and software. A questionnaire item (#11) asked if institutions were planning changes in their programs. Of the 37 institutions that had programs, one institution planned a change in the length of its program, five planned a change in the number or type of students served, three planned a change in the scope of their program, three planned a change in their equipment, and eight did not respond to the item. In addition, there were seventeen institutions that indicated two or more planned changes in their program. Those data indicated that a change in the kind of equipment used was most frequently selected, while changes in the number or type of students served, scope and length of programs were noted to a lesser degree.

In many cases institutions described their planned changes. When the comments under each planned change were examined, they revealed a variety of ways that institutions would accomplish those changes. The first planned change listed in the questionnaire was "change in length of program." Others indicated that their courses would become more intensive, and several said that their programs would be lengthened in order to reach all prospective teachers. When all of the planned changes are instituted, there will be an almost 100% increase over the number of institutions already requiring their students to take instructional computing courses.

There were indications that four other institutions planned to change the scope of their programs by various methods. One institution indicated that it planned to offer a master's degree in educational technology with its computing program, while three institutions indicated they would "change the elective computing course to required for all preservice teachers," effect "more rigorous computing course requirements for students," and "emphasize authoring languages." Relative to a change in number or type of students served, one institution felt that secondary schools were not providing computing experiences for their students. To remedy that neglect, this institution indicated that it planned to open its computing facilities to high school students. Several institutions indicated that in-service teachers would have access to their computing facilities.

Finally, some institutions planned to either change the type of hardware used or get additional hardware and software. Most of the institutions will purchase microcomputers rather than increase their timesharing capabilities.

Computer science programs versus computer awareness programs. Computer science programs usually require that one or more programming languages be learned; while computer awareness courses/programs are usually overviews of the uses of computers in all facets of society (questionnaire items 16-19). Twenty-three of all 144 institutions responding required their preservice teachers to take a computer science course rather than have the students take an education course that contained a computer awareness component. When the data on the 37 institutions that had computer awareness programs were reviewed, it was found that the 23 institutions that required their preservice teachers to take a computer science course were among the 37 institutions that indicated that some type of computer awareness program was provided for teacher education students.

As a corollary to the intensity of the computing requirements of preservice teachers, institutions were asked if they felt that secondary schools were in need of computer science teachers--111 answered in the affirmative (item #17). When the questionnaires were manually examined to search for the incongruency between the 37 institutions that had programs, the 44 institutions that have definite plans to implement programs, and the overwhelming affirmative response to the need for high school teachers of computer science by 111 institutions (includes the 37 and 44 institutions mentioned above), the data showed that 19 institutions would definitely like to have programs and were in the early stages of program planning and five were in the midstage of program planning, but none was certain of a date for program implementation. These 24 institutions were reported earlier as "not classifiable" (Table 4). Thirty-three institutions either did not respond or answered "No" to the item.

All respondents were asked if their states certified teachers in computer science and if so, did their institution offer teacher education programs leading to such certification. Four institutions indicated that their states issued a certificate in computer science, but only two of those institutions offered programs to meet their states' certification requirements. Two of the four institutions were in Utah and the other two were in Kansas and Wisconsin. It can not be assumed that only three states certify teachers in computer science, because this investigation did not survey institutions in each of the 50 states.

Value of computing background for various teachers. Some groups of teachers are felt to need a computing background more than others. Respondents were asked to rate the value (high, medium, low) of a computer science background for prospective teachers of mathematics, science, social studies, vocational education, business education, art education, and elementary education. The values (high, medium, low) were arbitrarily assigned a weighted value (high=3, medium=2, low=1) in order to develop a ranking of the value of a computer science background for prospective teachers in the academic areas mentioned as indicated by the respondents. The frequencies in each group were multiplied by the arbitrarily assigned numerical value and then added [e.g., (36x3) + (75x2) + (21x1)] in order to rank the academic areas (Table 6). Questionnaire items 15 and 20 were used for this section.

Mathematics with a weighted total of 390 was the academic area in which the most respondents felt that a computer science background would be most beneficial. Science had the second highest ranking with a weighted total of 368. The other academic areas in order of their weighted totals are, business education--344, elementary education--279, vocational education--262, social studies--257, and art education--174 (Table 6).

In order to further gauge the feelings about the computing needs of various groups of teachers, all respondents were asked to rate the value of _all_ prospective teachers having skills necessary to write computer programs, to know the types of problems that are and are not amenable to computer solution (particularly in education), and to discuss issues of computing as they relate to societal uses of computers in general and educational uses in particular. The values (high, medium, low) were arbitrarily assigned weights in the same manner as in the previous section. When the data were analyzed, the skills of knowing the general types of problems amenable and not amenable to computer solution received the highest ratings (359 and 336). The ability to write computer programs received the lowest rating (230) with the other skills falling between the highest and lowest ratings (Table 7).

Projections for future development of computer awareness programs. Although 37 of the 144 institutions are providing computer

Table 6

Weighted Rankings of Value of Computer Science Background

	High = 3	+	Medium = 2	+	Low = 1	=	Totals
Mathematics	3 x 126 = 378	+	2 x 6 = 12	+	0	=	390
Science	3 x 108 = 324	+	2 x 22 = 44	+	0	=	368
Business Education	3 x 96 = 288	+	2 x 27 = 54	+	1 x 2 = 2	=	344
Elementary School	3 x 36 = 108	+	2 x 75 = 150	+	1 x 21 = 21	=	279
Vocational Education	3 x 39 = 117	+	2 x 69 = 138	+	1 x 7 = 7	=	262
Social Studies	3 x 22 = 66	+	2 x 84 = 168	+	1 x 23 = 23	=	257
Art Education	3 x 5 = 15	+	2 x 42 = 84	+	1 x 75 = 75	=	174

Table 7

Weighted Rankings of All Prospective Teachers Having Selected Computing Skills

	High = 3	+	Medium = 2	+	Low = 1	=	Totals
Know what general types of problems are amenable to computer solution (particularly in education)	3 x 95 = 285	+	2 x 35 = 70	+	1 x 4 = 4	=	359
Know what types of problems are not currently amenable to computer solution and why not (particularly in education)	3 x 79 = 237	+	2 x 46 = 92	+	1 x 7 = 4	=	336
Be able to discuss moral or human impact issues of computing as they relate to:							
societal uses of computers	3 x 65 = 195	+	2 x 54 = 108	+	1 x 14 = 14	=	317
educational uses particularly	3 x 65 = 195	+	2 x 43 = 86	+	1 x 10 = 10	=	291
Be able to write computer programs	3 x 19 = 57	+	2 x 60 = 120	+	1 x 53 = 53	=	230

awareness programs for future teachers, there is strong evidence that computing programs for preservice teachers will increase. In order to determine the future growth of computer awareness programs for preservice teachers, a series of questionnaire items (3A-3E) were included. The data indicated that 44 institutions were at the preparation level and would have programs by 1983 (Table 4), and five additional institutions, although uncertain about a date for program implementation, planned to have such programs. All 49 institutions will have a "hands-on" component.

The data showed that more institutions planned to use microcomputers (28) than timesharing (7), an indication of the increasing popularity of microcomputers. Fourteen institutions planned to use both timesharing and microcomputers.

One weakness of many existing programs will probably continue--many institutions will not require all prospective teachers to participate in computer awareness programs. Of the 44 institutions that have definite plans to implement programs in the future, only 21 would require all preservice teachers to participate. However, eight institutions indicated that one of their planned changes would be to require all students to take the computing programs. If these eight institutions are combined with the nine institutions reported earlier (p.51) as requiring all students to participate in computer awareness programs and the 21 institutions mentioned above, then the total of 38 institutions suggests that within the next few years, more than one-fourth of the institutions surveyed will require all of their preservice teachers to participate in computer awareness programs.

Although the number of computer awareness programs will grow in the future, the growth will not be widespread enough to provide opportunities for all prospective teachers to gain computing skills and become computer literate. Fifty-seven of the 144 institutions reported they have no plans to implement computer awareness programs in the forseeable future.

Barriers to development of computing programs. The questionnaire contained opportunities for respondents to indicate why institutions may not be implementing computer awareness programs (item #2). Shortage of trained faculty was the chief reason for lack of programs followed by lack of equipment, funds, time, and lack of interest. With 64 institutions indicating the availability of a "training program" for education faculty (p. 54), there is a possibility that "lack of trained faculty" will cease to be the leading cause for institutions not having computer awareness programs. As more faculty gain the needed expertise in instructional computing, more programs should become available for preservice teachers.

Those institutions that indicated a lack of equipment or funds will probably not find much relief in the near future because of the inflated economy. Experts now indicate that to set up a computing laboratory with 20-25 fully equipped microcomputers, an institution could expect to spend approximately $50,000. Even as the manufacturing processes for microcomputers become more streamlined, the inflated economy is not likely to cause a marked decrease in the cost of computing hardware.

In an attempt to learn as much as possible about institutions' reasons for lack of computer awareness programs, a space was provided on the questionnaire that allowed respondents to cite reasons other than those that were listed in item #2. The statement most often noted (by eight institutions) was "not enough time in preservice teachers' curricula" followed by lack of student interest," (by six institutions) and "covered in general education programs so no need for specifically designed programs" (by four institutions). Two respondents commented, "not convinced essential for all preservice teachers" and "not a part of certification requirements." Neither of these institutions was planning to implement computing programs for their preservice teachers in the forseeable future.

Even though this investigation found that 37 of 144 institutions that responded to this survey had computer awareness programs for preservice teachers, there is evidence that the number of computer awareness programs for preservice teachers will increase as more faculty gain the expertise needed to operate programs, as more funds become available to purchase computing materials, and as states begin to mandate the inclusion of computer training in the curricula of preservice teachers. Even if there is no mandate for such inclusion from states, the growing pervasiveness of computers in our society may be such that colleges of education will have no choice but to implement programs so that their graduates may be more competetive in an increasingly sophisticated and tight job market.

In Chapter V conclusions drawn regarding the findings of this investigation and recommendations are presented, which if followed, will produce additional data on the status of computer awareness programs in NCATE institutions and the impact of the computer on this nation's schools.

CHAPTER V
CONCLUSIONS AND RECOMMENDATIONS

This section presents conclusions and recommendations based on the data presented in the previous chapter. Data were collected with a questionnaire from the six strata of NCATE approved institutions described in Chapter III.

The data were used to find the number of schools of education that reported computer awareness training in the curricula of prospective teachers and whether or not there were differences in the level of inclusion of this training between privately supported and publicly supported institutions of higher education. In addition, questions were asked to determine the levels of implementation of computer awareness programs and whether or not there has been an increase or decrease in the number of institutions providing computer awareness training for prospective teachers when compared with an earlier study (Baker, 1976).

Thirty-seven (26%) of the 144 institutions that responded to this survey indicated that they had some type of computer awareness program for preservice teachers. The relatively small number of institutions that now have programs will be increased if the institutions that plan to implement programs within the next two to three years do so. Forty-four institutions indicated that their proposed programs would be operational before the end of 1983 and five additional institutions will implement programs but are uncertain about a target date. Therefore, within the near future approximately 86 of the 144 institutions that responded to this survey will have computing programs, increasing the level of computer awareness programs from 26% to approximately 60%. If this same percentage of probable implementation can be generalized to the entire NCATE population, then it can be expected that within two to three years, approximately 320 institutions will have computer programs for preservice teachers.

Only nine of the 37 institutions that presently have computer awareness programs required all of their prospective teachers to take the computer awareness program. However, eight additional institutions were planning to require their students to take computer awareness courses. The eight institutions represent a small percentage when compared to the total sample, but they will represent an almost 100% increase in the number of institutions that require all students to complete a computer awarenees program.

Privately supported and publicly supported institutions were about equal when the level of inclusion of computer training in the curricula of preservice teachers was considered. Twenty-six percent of the privately supported institutions that responded to the survey had computer training while 27% of the publicly supported institutions that responded indicated that they provided training in the use of computers for prospective teachers.

At the outset of this investigation it was expected that most of the institutions that would have computer awareness programs for preservice teachers would offer graduate degrees in teacher education. These institutions are more likely to have the faculty and equipment necessary to have computer programs for teachers. The data confirmed that expectation, for 78% (29) of the institutions that have computer awareness programs for preservice teachers offer graduate degrees. A review of the questionnaires showed that institutions having graduate programs will make up 76% (52) of the 68 institutions projected to have programs in the next three years.

This study identified the number of respondents at each of five levels of use: nonuse, preparation, routine, refinement, and integration (Hall and others, 1973, 1975, 1977). The data showed that 37 (26%) of the 144 institutions that responded were at the nonuse level and 44 (30%) were at the preparation level. Seven institutions were at the integration level. It is important to note that the 29 institutions at the refinement level were modifying their programs to have a greater impact on preservice teachers. The data did not show that either publicly supported or privately supported institutions were predominate in all levels of use as surveyed.

The findings on the levels of use are both instructive and disappointing. The theory on levels of use indicate that if an innovation fails to move to the stage of integration, it will probably not survive. In this study, only one institution had reached the level of integration, arbitrarily defined as having 50% or more of the faculty using computers in their teaching. It should be noted that this institution is privately supported with no graduate program.

Since this is a very small institution, 50% usage may mean that only two or three faculty members are using computers.

Until institutions of teacher education begin to move higher on the levels of use continuum, the future of computer use in the curricula of teacher education programs is uncertain. However, 64 of the 144 institutions that responded indicated that they have some type of training program designed for education faculty to gain instructional computing skills. These staff development programs should increase the number of faculty that utilize computers in teaching their classes as well as increase the number of institutions offering computer awareness programs.

When this investigation was compared with Baker's (1976) study, it found that 26% of the institutions that responded to this survey had instructional computing programs, while 37% of the institutions that responded to the Baker survey had computing programs for preservice teachers. This does not necessarily mean that there was a decrease in computer awareness programs from 1976 to the present. The studies were not directly comparable since the methods of selecting institutions differed. In addition, there could have been differences in perception regarding a definition of computer literacy between the time of the Baker study and this investigation. The level of sophistication of computer hardware and software that exists now was not widely available at the time of the Baker study. If no changes have been made in the computing programs reported in Baker's study, to take advantage of the technological advances in computers--especially microcomputers--then programs considered adequate at the time of the Baker investigation, may now be inadequate.

Given the low level of use as compared with the Baker study and the fact that only one institution has reached the level of integration, it must be concluded that by and large institutions of teacher preparation are not presently a part of the computer revolution. Given two to three years, there is evidence that more teacher education institutions will implement programs. In addition, those institutions that presently have programs may initiate changes that will strengthen their programs and more effectively prepare teachers with skills to help produce a computer literate society.

Recommendations growing out of this study address the following questions:

> 1. What can be done to implement computer awareness programs--for preservice teachers--in institutions where no programs presently exist?
> 2. What can be done to broaden the scope of computer awareness programs in institutions that presently have programs?

Finding answers to these questions suggest the following types of studies.

1. Identify those institutions that have been using computers effectively for a good period of time in their teacher education programs. Study these institutions to identify characteristics of effective programs and to identify the steps followed in initiating and implementing the program. Results of these studies will then need to be disseminated to teacher training institutions.

2. Conduct studies showing the growing usage of computers in public and private schools (K-12) and the reasons for such usage. Share the results of these studies with teacher education institutions to help them understand the necessity of training teachers to use computers.
3. Conduct studies that identify private and public sources of funding that will help institutions buy computer hardware and software and provide training in the use of computers for their faculties. Disseminate this information to all teacher education institutions.
4. Replicate this study in three or four years, using all institutions accredited by NCATE and using all eight levels of use, to determine further progress in the use of computer awareness programs in the curricula of preservice teachers.

APPENDIX A

QUESTIONNAIRE

Directions: Place a check in the blank(s) that for you best answers each question. Any comments will be appreciated.

1. Does your institution offer any type of computer awareness (computer literacy) program designed specifically for preservice teachers?

   YES_ _______ NO__ ______

   (If your answer was "YES" please go on to question 4)

2. Which of the following statements best describes your reason(s) for not having such a program:

   Lack of trained faculty __

   Lack of equipment____

   Lack of funds__ _

   Lack of time____

   Lack of interest____

   Other (describe) ____

3. If you are planning to implement a computer awareness program for preservice teachers in the future:

   A. What is the target date for implementation?____________________

   B. Will the program involve a "hands-on component? ____________________

   C. What type of equipment will you be using?
      Time sharing on a large computer_____

      Microcomputers _____

      (Type/Number)______________________)

   D. Will the program be required of all preservice teachers? YES____ NO____

E. If the program will not be required of all preservice teachers, will it be required of any of the following groups of teachers:

Mathematics Education _____

Social Science Education _____

Business Education _____

Science Education _____

Language Arts Education _____

Elementary School Teachers _____

Other____

Please Go On To Question 13

4. Is the computer awareness program required of all preservice teachers?

YES_____ NO_____

5. If the program is not required of all preservice teachers is it required of any of the following groups of teachers:

Mathematics Education _____

Social Science Education _____

Business Education _____

Science Education _____

Language Arts Education _____

Elementary School Teachers _____

Other____

6. How long has the program been existence?____________________

7. Which of the following best describes your computer awareness program for preservice teachers:

A. A module within an education course_____
(Type of course____)
(Length of module______________________________________)

B. A full course or seminar_____
(Title of course______________________________)

C. Other (Please describe and include length of program)

____

____

8. Is the computer awareness program for preservice teachers conducted by:

A. College of Education Faculty_____

B. Computer Science Faculty _____

C. Other (describe)______________________________

9. Which of the following computer skills, if any, are students taught in the computer awareness program:

A. Writing Programs _____ B. Reviewing Programs_____

C. Modifying Programs_____ D. Designing Programs_____

E. Use of the computer as a problem solving tool _____

F. Other (specify)______________________________

10. Which, if any, programming languages are taught to preservice teachers as part of the computer awareness program:

BASIC _____ PASCAL_____

FORTRAN_____ PL/I _____

APL _____ Other (specify)_______________

11. Which of the following changes, if any, are planned for your computer awareness program in the future:

A. Change in length of program_____
Comments______________________________________

B. Change in number or type of students served_____
Comments______________________________________

C. Change in scope of program_____
Comments______________________________________

D. Change in equipment (amount or type)______
Comments______________________________________

12. Does the computer awareness program involve a "hands-on" component?

YES_____ NO_____

What type of equipment used?____________________________________

13. Is there any type of "training program" designed for education faculty to gain instructional computing skills? (Released time for courses/in-service programs/etc.)

YES_____ NO_____

Please describe____

14. Approximately what percent of the education faculty utilize computers in teaching their classes?

____

15. Please rate the value of a computer science background for a prospective teacher of:

	HIGH	MEDIUM	LOW
Mathematics	_____	_____	_____
Science	_____	_____	_____
Social Science	_____	_____	_____
Vocational Education	_____	_____	_____
Business Education	_____	_____	_____
Art Education	_____	_____	_____
Elementary School	_____	_____	_____

16. Is a computer science course (in contrast to a computer awareness program required of any preservice teachers?

YES_____ NO_____

17. Do you feel there is a need for high school teachers of computer science?

YES_____ NO_____

18. Does your state have a school certification in computer science?

YES_____ NO_____

19. If "YES," do you have a teacher education program leading to this certification?

YES_____ NO_____

20. Please rate the value of all prospective teachers having the following skills:

	HIGH	MEDIUM	LOW
A. Be able to write computer programs	_____	_____	_____
B. Know what general types of problems are amenable to computer solution (particularly in educa-	_____	_____	_____
C. Know what types of problems are not currently amenable to computer solution and why not (particularly in education)	_____	_____	_____
D. Be able to discuss moral or human impact issues of computing as they relate to			
i) societal uses of computers generally	_____	_____	_____
ii) educational uses particularly	_____	_____	_____

21. If you would like a copy of the results, please fill in the blanks below.

NAME______________________________

TITLE______________________________

INSTITUTION______________________________

ADDRESS______________________________

____
(Zip Code)

APPENDIX B
FIRST COVER LETTER

June 4, 1981

Dear Dean:

The enclosed survey instrument has been designed to assess the status of computer awareness (computer literacy) programs in NCATE approved colleges and universities. We hope that the information received will help us to improve our present program and that, in turn, the results will be of use to you.

Other phases of this study cannot be carried out until we receive responses. We would greatly appreciate your taking the few minutes required to complete the questionnaire. A self-addressed stamped envelope has been provided and we need to have the questionnaire returned by June 19.

Thank you for your cooperation.

Sincerely,

David Smith, Dean
College of Education

APPENDIX C
SECOND COVER LETTER

July 7, 1981

Dear Dean:

Recently you were mailed a questionnaire that was designed to assess the status of computer awareness (computer literacy) programs in NCATE approved colleges and universities. As yet we have not received your response.

Other phases of this study cannot be carried out until we receive responses. We would greatly appreciate your taking the few minutes required to complete the questionnaire. A self-addressed stamped envelope has been provided and we need to have the questionnaire returned by July 17.

Thank you for your cooperation.

Sincerely,

David C. Smith, Dean
College of Education

APPENDIX D

SUMMARY OF QUESTIONNAIRE RESULTS

F = Frequencies P = Percents NR = No response

1. Does your institution offer any type of computer awareness (computer literacy) program designed specifically for preservice teachers?

	F	P
Yes	37	26
No	106	73
NR	1	1
Totals	144	100

2. Which of the following statements best describes your reason (s) for not having such a program:

		F	P
a.	Lack of trained faculty	6	6
b.	Lack of equipment	4	4
c.	Lack of funds	7	7
d.	Lack of time	6	6
e.	Lack of interest	5	5
f.	Combination of a, b, & c	11	10
g.	Combination of d & e	0	0
h.	Any other combination	44	42
i.	Other	20	19
j.	No response	3	3
	Totals	106	102*

*In many cases the totals exceed 100% because of rounding off and the inclusion of some objects in more than one classification group.

3. If you are planning to implement a computer awareness program for preservice teachers in the future:

A. What is the target date for implementation?

	F	P
1981	17	16
1982	21	20
1983	6	6
Uncertain	5	5
NR	57	54
Totals	106	101

B. Will the program involve a "hands-on" component?

	F	P
Yes	49	46
No	57	54
Totals	106	100

C. What type of equipment will you be using?

	F	P
Timesharing	7	7
Microcomputers	28	26
Both	14	13
NR	57	54
Totals	106	100

D. Will the program be required of all preservice teachers?

	F	P
Yes	21	20
No	29	27
NR	56	53
Totals	106	100

E. If the program will not be required of all preservice teachers, will it be required of any of the following groups of teachers:

	F	P
Mathematics Education	2	2
Social Science Education	0	0
Business Education	0	0
Science Education	0	0
Language Arts Education	0	0
Elementary School Teachers	3	3
Other	4	4
Any Combination	20	19
NR	77	73
Totals	106	101

4. Is the computer awareness program required of all preservice teachers?

	F	P
Yes	9	24
No	28	76
Totals	37	100

5. If the program is not required of all preservice teachers is it required of any of the following groups of teachers:

	F	P
Mathematics Education	5	18
Social Science Education	0	0
Business Education	0	0
Science Education	0	0
Language Arts Education	0	0
Elementary School Teachers	3	11
Any Combination	8	29
Other	4	14
NR	8	29
Totals	28	101

6. How long has the program been in existence?

	F	P
1 year	12	32
2 years	13	35
3 years	2	5
More than 3 years	10	27
Totals	37	99

7. Which of the following best describes your computer awareness program for preservice teachers:

	F	P
A. A module within an education course	13	35
B. A full course or seminar	14	38
C. Other	5	13
D. Both A & B	4	11
E. NR	1	3
Totals	37	100

8. Is the computer awareness program for preservice teachers conducted by:

	F	P
A. College of Education Faculty	23	62
B. Computer Science FAculty	5	14
C. Other	3	8
D. Both A & B	6	16
Totals	37	100

9. Which of the following computer skills, if any, are students taught in the computer awareness program:

	F	P
A. Writing Programs	0	0
B. Reviewing Programs	2	5
C. Modifying Programs	0	0
D. Designing Programs	0	0
E. Use of the computer as a problem solving tool	2	5
F. Other	2	5
G. Two or more of the above	31	84
Totals	37	99

10. Which, if any, programming languages are taught to preservice teachers as part of the computer awareness program:

	F	P
BASIC	22	59
FORTRAN	1	3
APL	0	0
PASCAL	0	0
PL/I	0	0
Other	4	11
Any Combination	4	11
NR	6	17
Totals	37	101

11. Which of the following changes, if any, are planned for your computer awareness program in the future:

	F	P
A. Change in length of program	1	3
B. Change in number or type of students served	5	13
C. Change in scope of program	3	8
D. Change in equipment	3	8
E. Any combination of the above	17	46
F. NR	8	22
Totals	37	100

12. Does the computer awareness program involve a "hands-on" component?

	F	P
Yes	36	97
No	0	0
NR	1	3
Totals	37	100

What type of equipment used?

	F	P
Microcomputers	22	59
Timesharing	2	5
Both of the above	4	11
NR	9	24
Totals	37	99

13. Is there any type of "training program" designed for education faculty to gain instructional computing skills. (Released time for courses/in-service programs/etc.)

	F	P
Yes	64	44
No	66	46
NR	14	10
Totals	144	100

14. Approximately what percent of the education faculty utilize computers in teaching their classes?

	F	P
0 - 25	113	78
26 - 50	8	6
51 - 75	1	1
76 - 100	0	0
NR	22	15
Totals	144	100

15. Please rate the value of a computer science background for a prospective teacher of:

	HIGH		MEDIUM		LOW		NR		TOTALS	
	F	P	F	P	F	P	F	P	F	P
Mathematics	126	88	6	4	0	0	12	8	144	100
Science	108	75	22	15	0	0	14	10	144	100
Social Studies	22	15	84	58	23	16	15	10	144	99
Vocational Education	39	27	69	48	7	5	29	20	144	100
Business Education	96	67	27	19	2	1	19	13	144	100
Art Education	5	3	42	29	75	52	22	15	144	99
Elementary School	36	25	75	52	21	15	12	8	144	100

16. Is a computer science course (in contrast to a computer awareness program) required of any preservice teachers?

	F	P
Yes	23	16
No	110	76
NR	11	8
Totals	144	100

17. Do you feel there is a need for high school teachers of computer science?

	F	P
Yes	111	77
No	18	13
NR	15	10
Totals	144	100

18. Does your state have a school certification in computer science?

	F	P
Yes	4	3
No	120	83
NR	20	14
Totals	144	100

19. If "Yes," do you have a teacher education program leading to this certification?

	F	P
Yes	2	1
No	2	1
NR	140	97
Totals	144	99

20. Please rate the value of all prospective teachers having the following skills:

	HIGH		MEDIUM		LOW		NR		TOTALS	
	F	P	F	P	F	P	F	P	F	P
A. Be able to write computer programs	19	13	60	42	53	37	12	8	144	100
B. Know what general types of problems are amenable to computer solution (particularly in education)	95	66	35	24	4	3	10	7	144	100
C. Know what types of problems are not currently amenable to computer solution and why not (particularly in education)	79	55	46	32	7	5	12	8	144	100
D. Be able to discuss moral or human impact issues of computing as they relate to										
i) societal uses of computers generally	65	45	54	37	14	10	11	8	144	100
ii) educational uses particularly	65	45	43	30	10	7	26	18	144	100

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BIOGRAPHICAL SKETCH

Ollie Daniels was born January 30, 1944, in Bowling Green, Florida. He graduated as valedictorian of the 1960 class of Lillian R. Brown High School, Wauchula, Florida, where he was recognized for his academic achievements by the Danforth Foundation. In 1961 he entered Edward Waters College, Jacksonville, Florida where he majored in science. After graduating from Edward Waters College in 1966, he began his teaching career at Stanton Vocational High School in Jacksonville, where he taught chemistry and biology.

In 1968, he entered Texas Southern University through a program supported by the National Science Foundation, and graduated in 1970 with a Master of Science degree with a major in biology and a minor in chemistry. During his stay in Texas, he and his wife had the opportunity to tour the southwestern United States and Mexico. In 1972, he was invited to attend the National Science Foundation's Grant Recommendation Proceedings in Washington, D. C., where grant proposals for Summer Institutes for Science and Mathematics Teachers and Academic Year Institutes for Science and Mathematics Teachers were reviewed and recommended for approval. From 1969 through 1978, he taught science and served as department chairman at Technical High School in Jacksonville and from 1972 through 1980 he served as a part-time instructor at Florida Junior College in Jacksonville.

In 1973 he was presented the Teacher-Student Humanitarian Award by the Jacksonville B'nai B'rith Organization. From 1976-1979 he was given awards for dedicated volunteer work at the Eartha M. M. White Nursing Home. In 1977 and 1978 he was selected teacher of the year by the principal of Technical High School. He is very active in his church, St. Stephen African Methodist Episcopal where he serves on the senior board of stewards and the finance committee. He is also a member of the Jacksonville Blood Bank and a Master Mason.

In 1978 he began his doctoral studies in the College of Education at the University of Florida to pursue a Doctor of Education degree in the Department of Instructional Leadership and Support. He also held the position of graduate assistant and later teaching assistant in the Department of Subject Specialization Teacher Education.

Ollie Daniels is married to the former Mardrivon Brown and is the father of two children, Patrick and Kimberly and the guardian of a niece, Evelyn Brown.

He is a member of Phi Delta Kappa.

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Education.

Arthur J. Lewis

Arthur J. Lewis, Chairman
Professor of Instructional
Leadership and Support

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Education.

Eugene A. Todd

Eugene A. Todd, Co-chairman
Professor of Subject Specialization
Teacher Education

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Education.

Elroy J. Bolduc, Jr.
Professor of Subject Specialization
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This dissertation was submitted to the Graduate Faculty of the Division of Curriculum and Instruction in the College of Education and to the Graduate Council, and was accepted as partial fulfillment of the requirements for the degree of Doctor of Education.

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